5841

NETWORK WORKING GROUP

REQUEST FOR COMMENT: 125

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Response to RFC #86, Proposal for Network Standard Format for a graphics data stream.

Category	D.6
RFCS obsoleted	None
RFCS updated	86

The basic approach of transmitting an intermediate, device independent language which is translated into specific device codes at the receiving host is sound. It appears to be the only approach that will allow thought to be centered on picture descriptions. Ames Research Center has adopted this approach in tying its graphic facilities, of various types, and on various computers together. At present, we are in the design phase and expect our package to be running in about six months. The main objections to the structure as it now exists, is that it takes no cognizance of the many features available on graphics devices. Since these features will always be changing with new devices, a set of option or mode primitives should be defined which are logically separate from the drawing primitives provided in RFC 86. The mode primitives will act upon the drawing primitives to modify their actions. The scope of a mode primitive extends until a new mode primitive resets an option. The use of mode primitives will allow the network the network standard stream interpreter to treat them as null operations if the features are missing at a particular host, or to perform more detailed interpretation of the following data stream to achieve results. The drawing primitives may also then keep a standard format which need not be changed to incorporate new features.

Overall modes which primitives could control would be intensity levels, or color selections for objects, in addition blinking of objects should be provided. For vectors, the additional facility for drawing dashed lines is necessary.

Character strings require another set of specification. The convention for the beam is usually that it is in the center of the rectangular area defining a character's boundaries. The beam position is usually undefined at the finish of drawing a character string. A strong exception is taken to the exclusion of form control characters from strings. If included in the character string, they could provide for shifting from upper to lower case, subscripting, superscripting, and underscoring, as well as tab and other "carriage" motion functions. The appropriate characters could be extracted at interpretation time to provide the necessary information to display more complex strings. To allow the facility for generating algol-like delimiters, such as then, a convention for canonical character string should be adopted. I believe the multics conventions described in reference 1 will suffice.

Additional options for character strings should include a size specification and an orientation selection. As many devices, have hardware character generators that are fixed, some of these options may not be desirable to implement as subroutines.

Another area that should be looked at further is the additional symbols available which are not specified in ASCII. Some means of defining them should be provided within the argument string itself, again multics has allowed the specification of arbitrary characters by entering their octal equivalents. The convention should use a control character code followed by a 16-bit list name which specifies the sub-list defining the character. The other alternative is to allow

8-bit characters and allow the interpreter to choose a sub-list if the character is not realizable with a hardware generator.

The special form control characters to be used are:

a. BS - backspace
b. LF - for new line
c. SO1 - shift case
d. DC2 - superscript following characters
e. DC4 - subscript following characters
f. DC3 - special non-ASCII character follows
g. Tab - position to next tab. May be predefined or specified.

Another construct should be added to those proposed in RFC 86. This is the display list pointer (NGDLP). It will have as a value the next drawing primitive to be executed. The value is a displacement from the head of a list. With no mode setting primitives, this value is one to one with the drawing primitives transmitted in the NGDS. The NGDLP is needed for consistency for execution of the nested list structure. Whenever an execute list primitive is encountered, the current value of the NGDLP is saved along with the list name and current origin value. When execution of a list is finished, the last values saved are restored.

An include list primitive would allow the treatment of a sub-list to be equivalent to a macro instead of a subroutine. This would be necessary to avoid changes to all sub-pictures on the screen due to the manipulation of a sub-list. The include primitive should have as parameters such specifications as size, intensity, orientation, blinking, etc. After a sub-list has been included in another list, it is no longer distinguished as a separate entity.

To cut down on the volume of data being transferred, other commands to be parsed by the stream interpreter should be added. These would allow the manipulation of a list by the receiving hose without a retransmission. The types of manipulations would include rescaling the coordinates for shrinking or zooming, translation of the origin, or rotation. Other manipulations to provide for displaying or not displaying a list, or enabling of disabling light pen detections would be desirable.

The problem of interaction with the displayed picture has yet to be addressed, so this will be an attempt to elicit some more discussion in this area. The use of a keyboard or function keys poses no problem in that both can be handled as a standard message from the graphics terminal. The use of devices that interact with the picture or the screen such as light pens, mice, joysticks, or tablets presents a different and more complex problem. This problem is the standard one of making an association between the point selected and some meaningful entity such as a list or a primitive. This association should be made at the receiving host since the NGDS has been changed in unknown ways.

To allow the transmitting host to identify the object pointed at, the stack of suspended lists and the current value of the NGDLP will qualify the object to any level in a hierarchal structure. In addition, normalized x,y coordinates should be returned, as well as a character displacement if a string was pointed at. This structure will serve a light pen device very well since the light pen mechanism allows the determination of the currently executing primitive. Other devices interact with the picture in an asynchronous fashion and the association of an x,y pair to a structure is a more difficult problem. This may require that the host generating the graphic data stream be responsible for making that association. A further complication arises when it is desired to use a light pen in an area where no beam motion occurs, then some directive to periodically sweeep the screen and "find" the pen must be provided. This might be a sub-list which is executed periodically for this function.

Reference: Osanna, J., Sahzer, J.
Remote Terminal Character Stream Processing of Multics
Proceedings SJCC, 1970, p. 671